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AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

THE UNIVERSITY OF SYDNEY

Invention Title:

LIGHT ROUTING WITH BRAGG GRATINGS

The invention is described in the following statement:

LIGHT ROUTING WITH BRAGG GRATINGS

Field of the Invention

The present invention relates to the field of optical waveguides and, in particular, discloses the utilization of Bragg Grating type structures to provide for enhanced light control within a waveguide.

Background of the Invention

In optical waveguides, and in particular, in planar type waveguides, it is difficult to produce sharp angled bends for the light to travel along. Unfortunately, due to the refractive index properties of the waveguide, it is more likely that light will be diffracted out of tight bending "circuits" thereby resulting in reduced capabilities and limitations on performance.

Summary of the Invention

It is an objection of the present invention to provide for an improved form of light handling within a waveguide structure.

In accordance with a first aspect of the present invention, there is provided in an optical waveguide device, a method of projecting light around a tight bend comprising the step of: forming a periodic grating structure in the vicinity of the bend so as to transmit predetermined wavelengths of the light around the bend.

The periodic grating structure can be utilized in a reflection or transmission mode.

The method can also be utilized to separate predetermined frequencies from a main waveguide transmission path or to split a main beam of light into multiple component beams.

Brief Description of the Drawings

Notwithstanding any other forms which may fall within the scope of the present invention, preferred forms of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figs. 1 - 5 illustrate schematically various arrangements of utilizing a Bragg grating structures in

conjunction with an optical waveguide so as to enhance desired waveguide directional characteristics.

Description of Preferred and Other Embodiments

In the preferred embodiment, a matched Bragg grating is written over the tight bend of an optical circuit so as to provide for enhanced routing capabilities.

Turning initially to Fig. 1, there is illustrated schematically a first example embodiment wherein a waveguide 1, down which light 2 is to be projected, undergoes a tight bend in the desired path. In the vicinity of the tight bend, a grating structure 4 is written. The grating structure 4 acts as a photonic band gap preventing the effervescent light 2 from leaking out and resulting in higher efficiency in the light coupled to output 5. This results in a substantial reduction in the bending loss as a result of the utilization of the defraction grating 4 which in turn allows for tighter bends to be formed in the waveguide structure. The wavelength of the grating 4 can be tuned so as to match desired frequencies for operation.

Alternatively, as illustrated in Fig. 2, the grating 6 can be written in a reflection mode so as to provide for reflection of desired frequencies along the path 7 with losses 8 for those frequencies not having desired characteristics.

The utilization of the arrangement of Fig. 2 can be extended so as to provide for wavelength division multiplexing capabilities on a waveguide structure. This is illustrated in Fig. 3 wherein initial light can be launched down a waveguide having a number of frequencies $\lambda 1$, $\lambda 2$, $\lambda 3$ coupled out of the waveguide by utilization of corresponding matched Bragg gratings 12, 13, 14 which operate so as to filter out the requisite frequencies.

Fig. 4 illustrates a further arrangement whereby light coupled along waveguide 15 will be coupled to outputs 16, 17 by means of suitably matched Bragg grating 18 having desired periodic characteristics, matched to the desired

frequencies for coupling. The surrounding waveguide refractive index regions eg. 19 can be tapered to provide for stronger coupling. Preferably, the splitter arrangement of Fig. 4 has a Bragg grating coupled such that 50% of the light traverses along each of path 17, 18. This can be achieved for wavelengths twice the Bragg period. Of course, it is possible to adjust the Bragg period to adjust the output angle and coupling efficiency.

Similarly, in Fig. 5 a Bragg grating 20 is provided for coupling around a bend for light travelling along the path 21, 22.

It would be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

We Claim

1. In an optical waveguide device, a method of projecting light around a tight bend comprising the step of forming a periodic grating structure in the vicinity of said bend so as to transmit predetermined wavelengths of said light around said bend.

2. A method as claimed in claim 1 wherein said periodic grating structure is utilized in a reflection mode.

3. A method as claimed in claim 1 wherein said periodic grating structure is utilized in a transmission mode.

4. A method as claimed in any previous claim wherein said method is utilized to separate predetermined frequencies from a main waveguide transmission path.

5. A method as claimed in any previous claim wherein said method is utilized to split a main beam of light into multiple component beams.

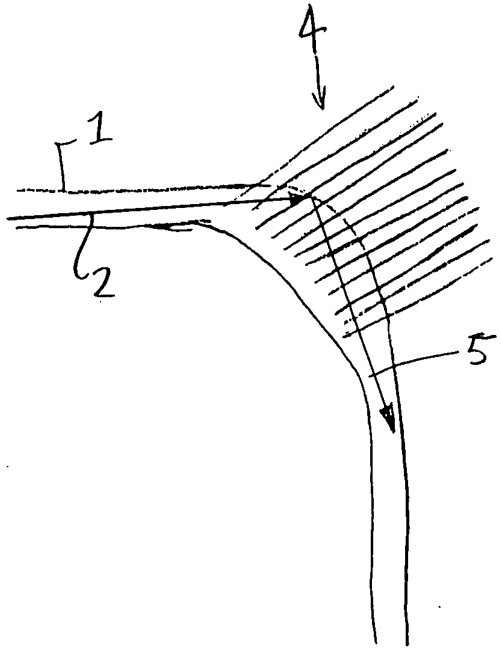

Fig. 1

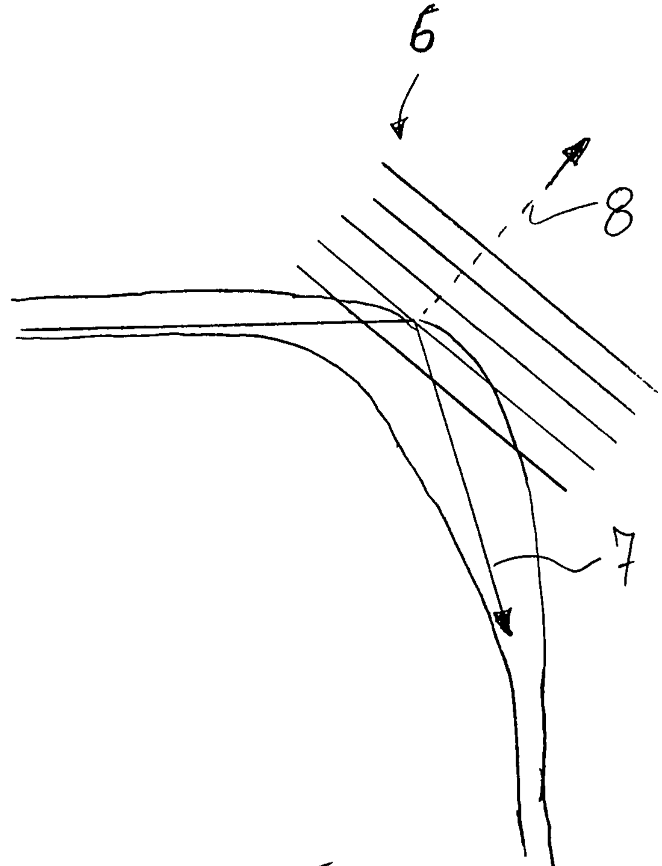

Fig. 2

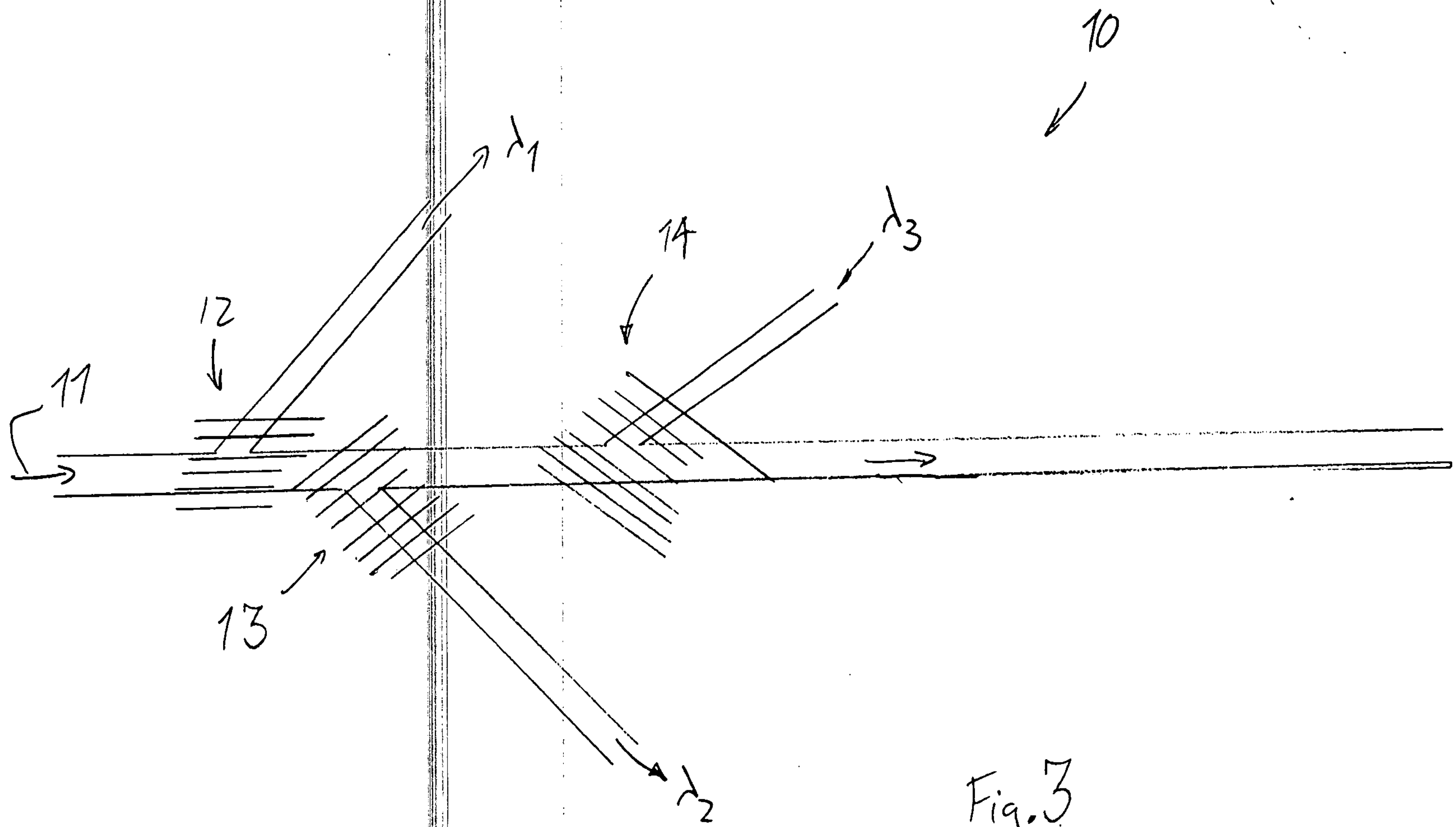

Fig. 3

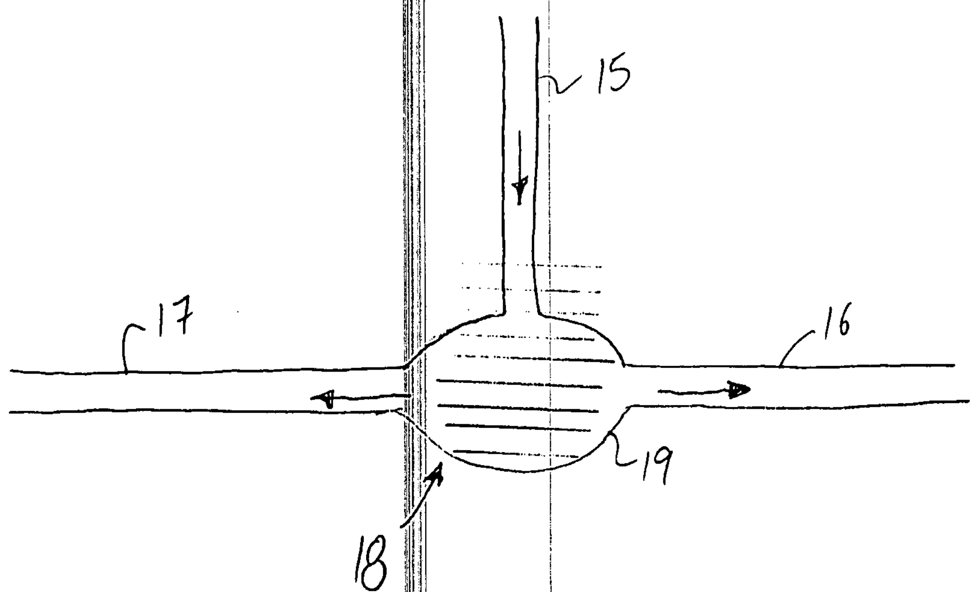

Fig. 4

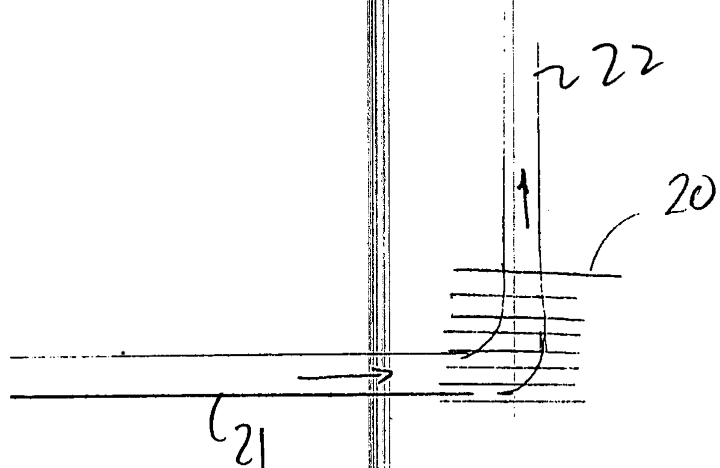

Fig. 5

Abstract

In an optical waveguide device, a method of projecting light around a tight bend comprising the step of: forming a periodic grating structure in the vicinity of the bend so as to transmit predetermined wavelengths of the light around the bend.